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Belen et al.

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(54) **PIPE HANGER WITH LOCK TAB WASHER**

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F16B 39/10 (2006.01)

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CPC ***F16L 3/11*** (2013.01); ***F16B 39/108*** (2013.01); ***F16L 3/133*** (2013.01)

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See application file for complete search history.

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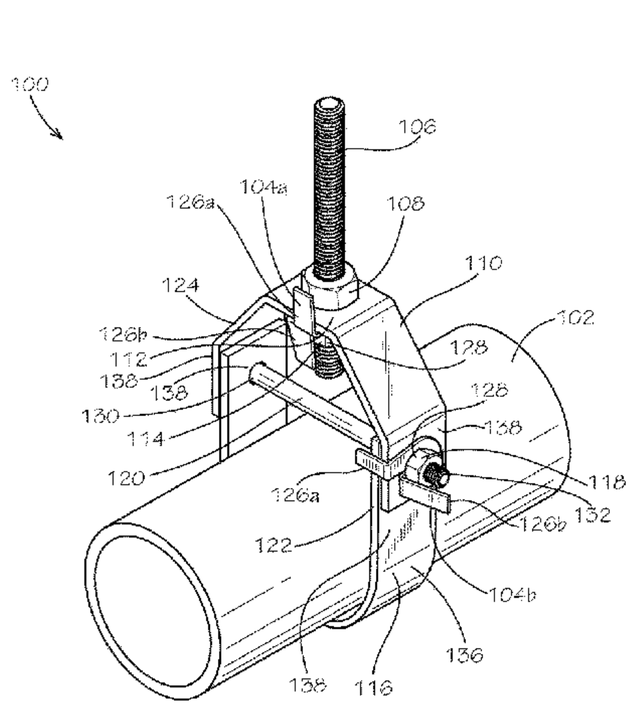
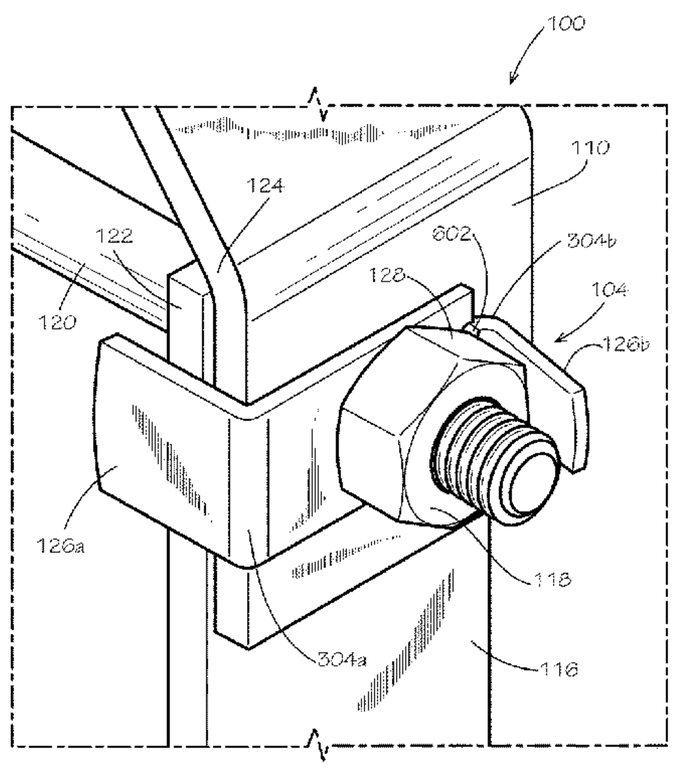
(57) **ABSTRACT**

A hanger for a pipe, the hanger comprising: a suspension member configured to engage the pipe, the suspension member comprising a side edge and defining a hole in through the suspension member; a threaded rod extending through the hole; a nut threaded on the threaded rod; and a lock tab washer disposed on the threaded rod between the suspension member and the nut, the lock tab washer comprising a first tab and a second tab, the first tab bent over a side edge of the suspension member, the first tab configured to prevent the lock tab washer from rotating with respect to the suspension member, the second tab bent over a circumferential side of the nut, the second tab configured to prevent the nut from rotating with respect to the lock tab washer.

14 Claims, 13 Drawing Sheets





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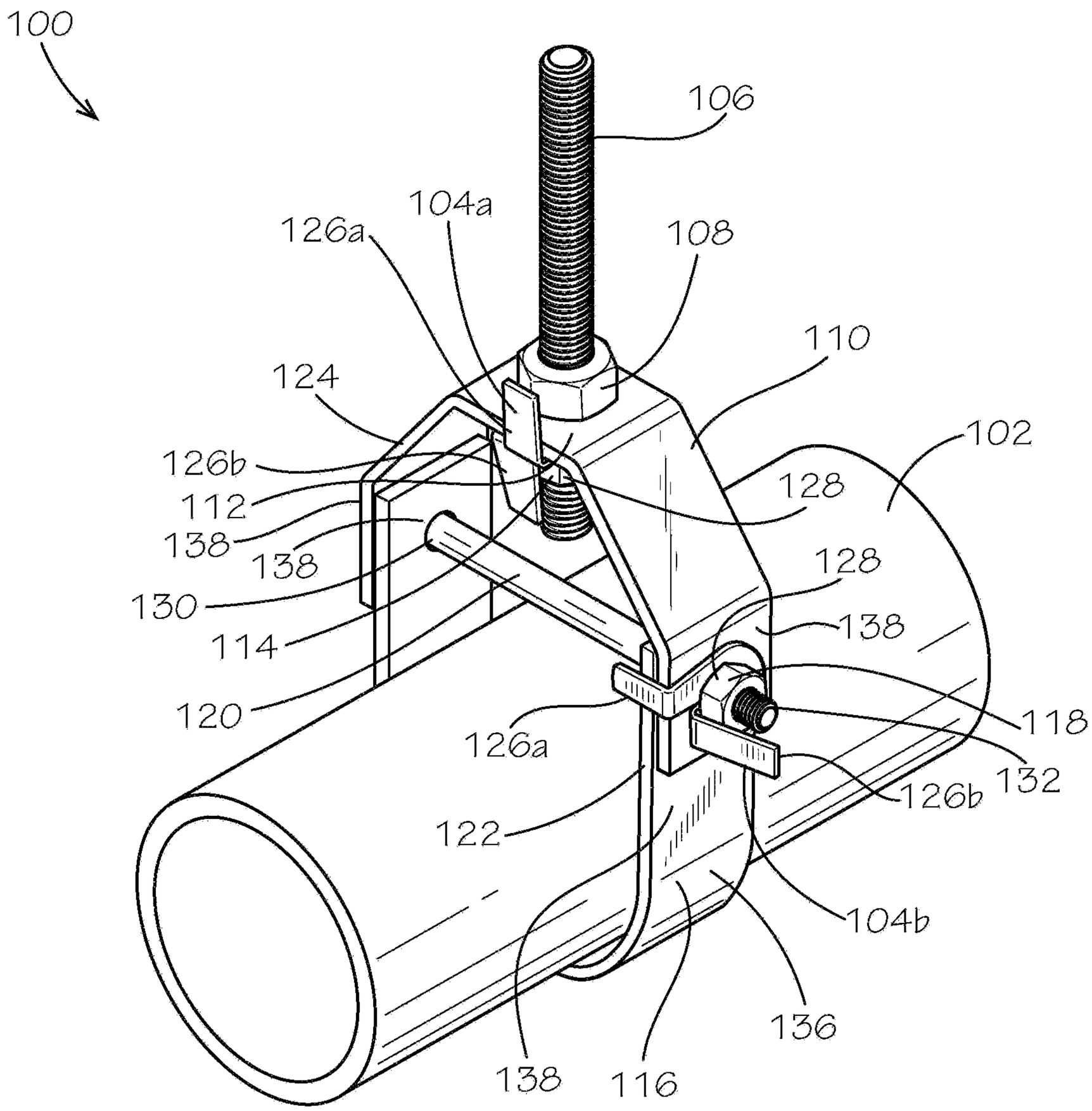
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104a
126a
108
110
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102
126b
112
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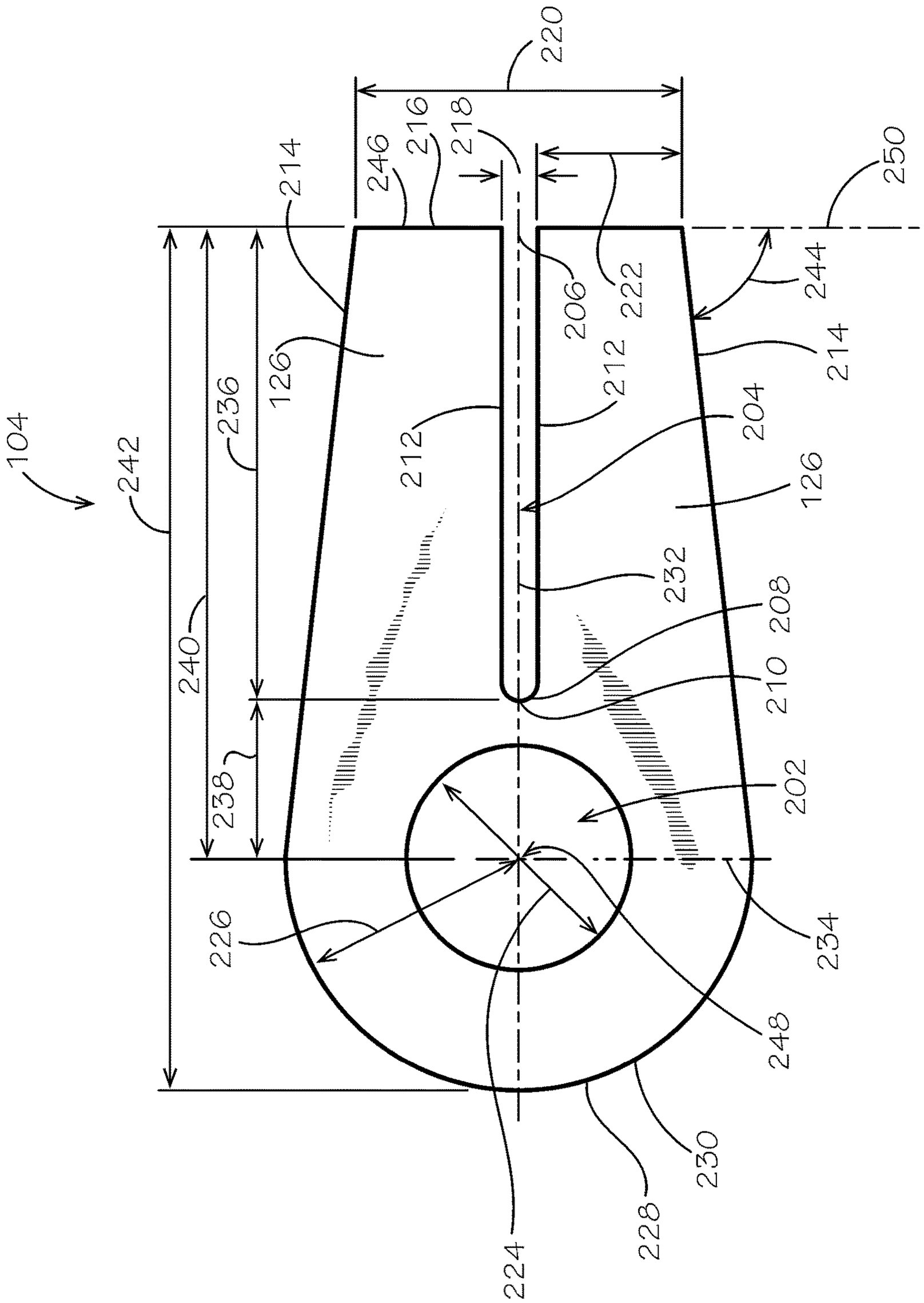
132
126b
122
104b
136
138
116

FIG. 1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232
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226
234
224
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230
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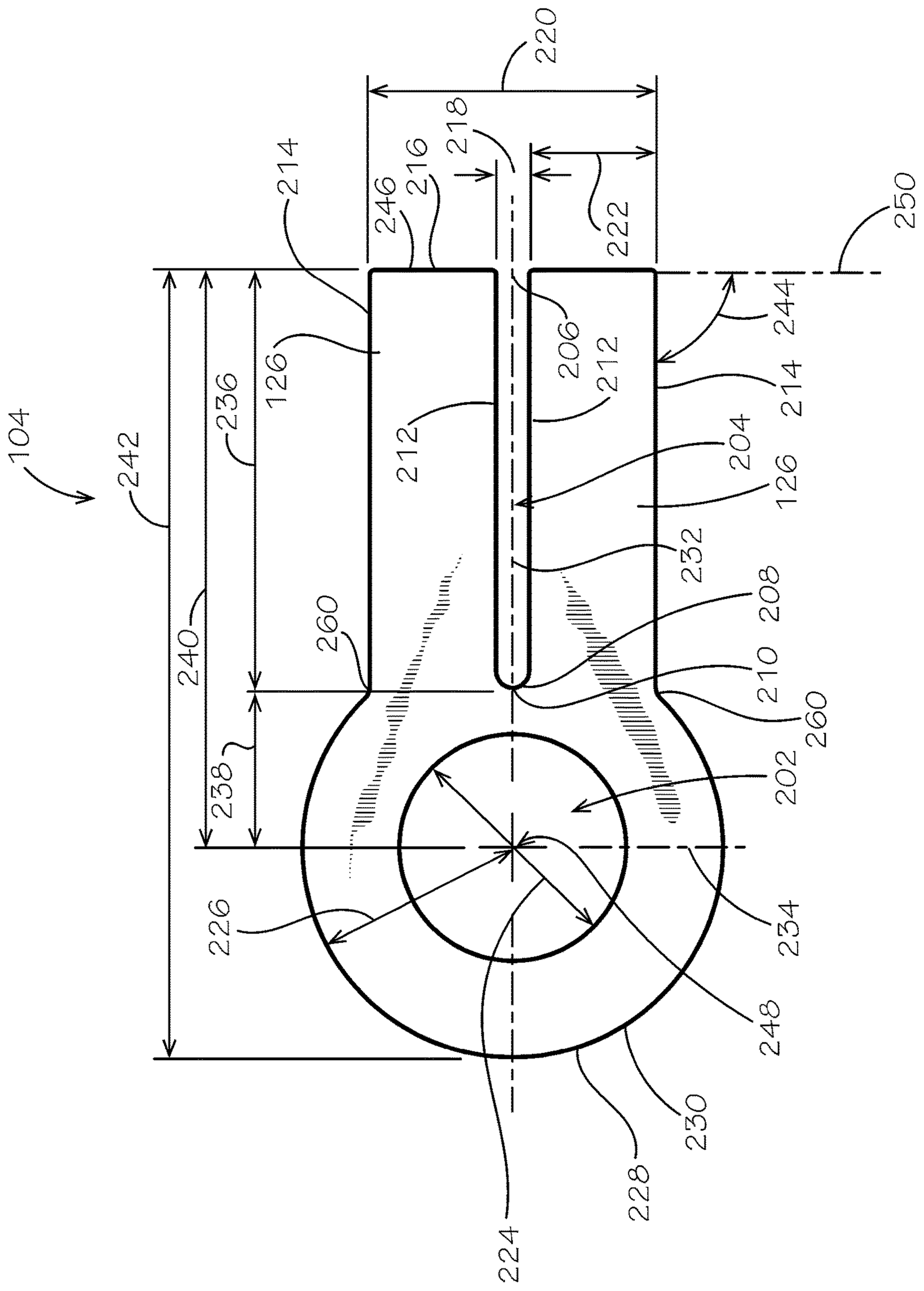
FIG. 2A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232
208
210
260
260
202
234
248
226
224
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230

FIG. 2B

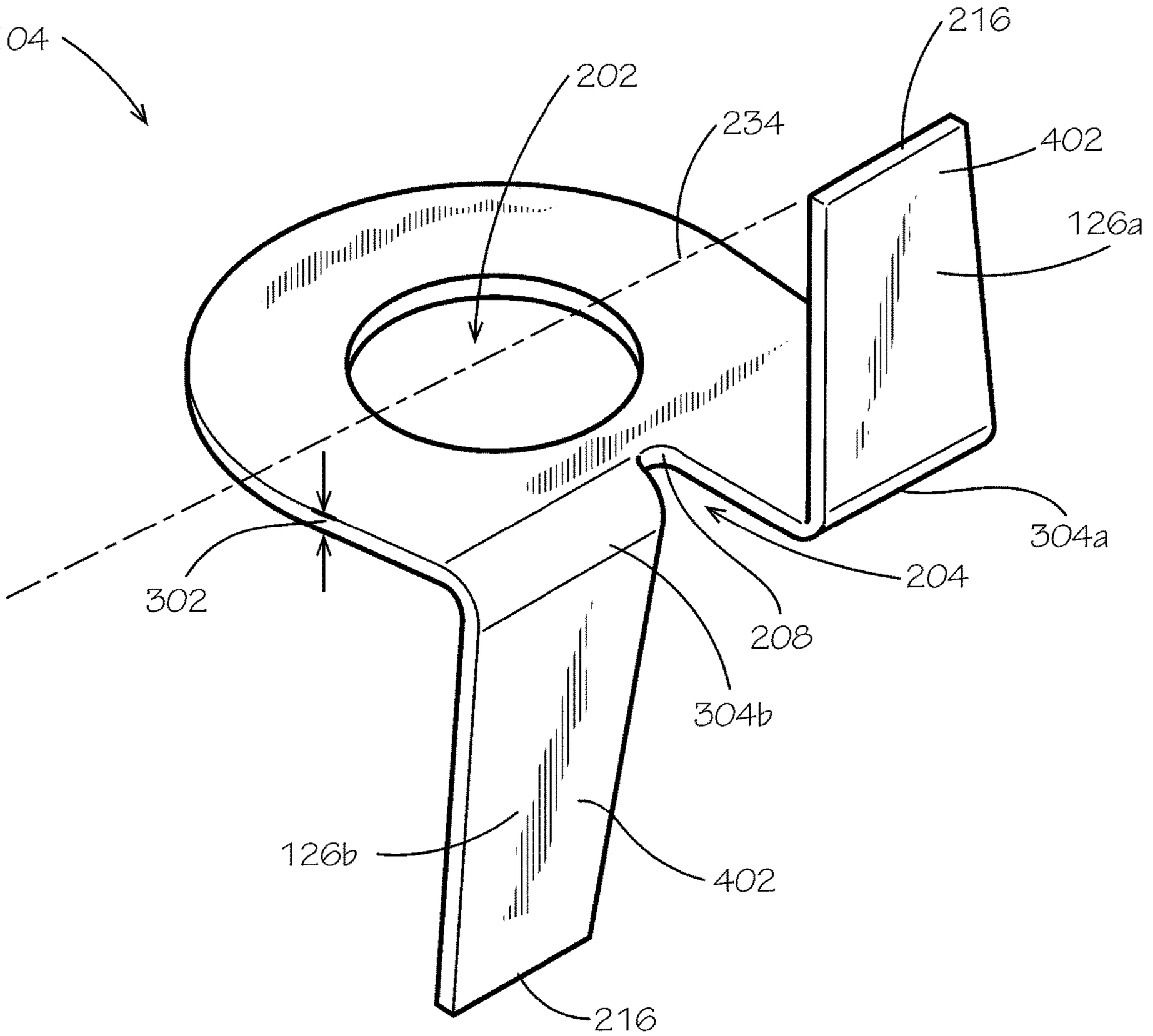


FIG. 3A

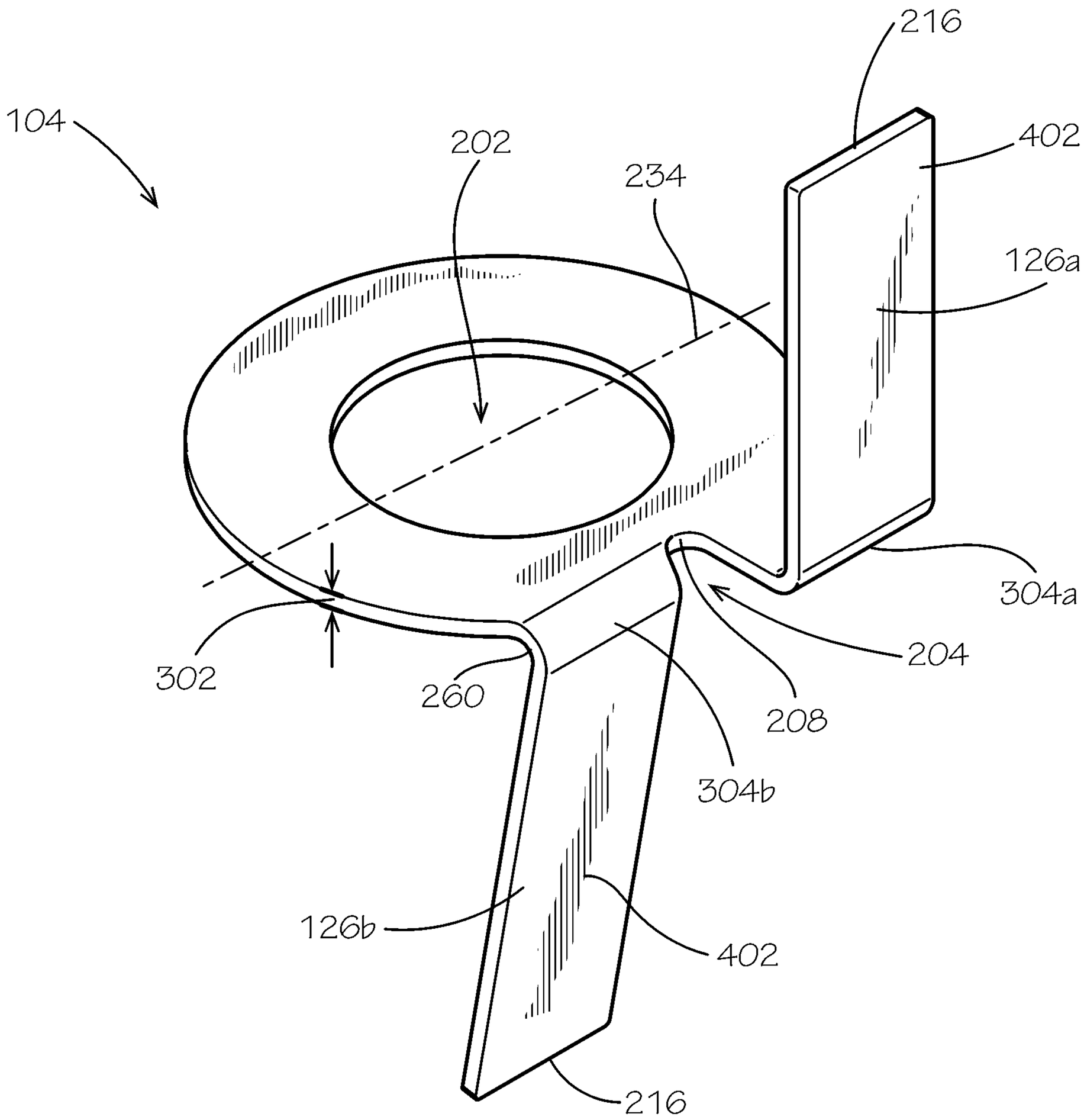
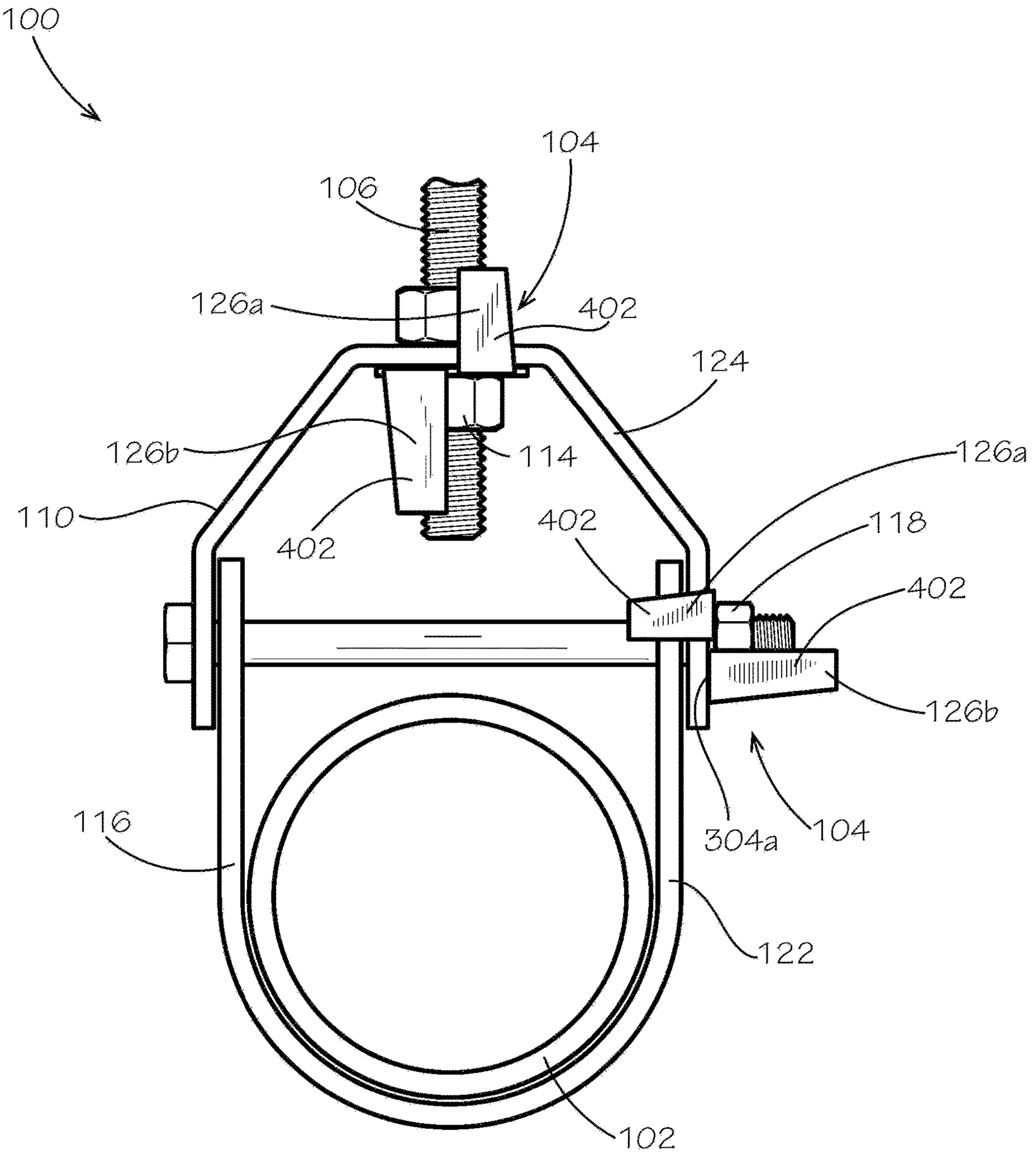


FIG. 3B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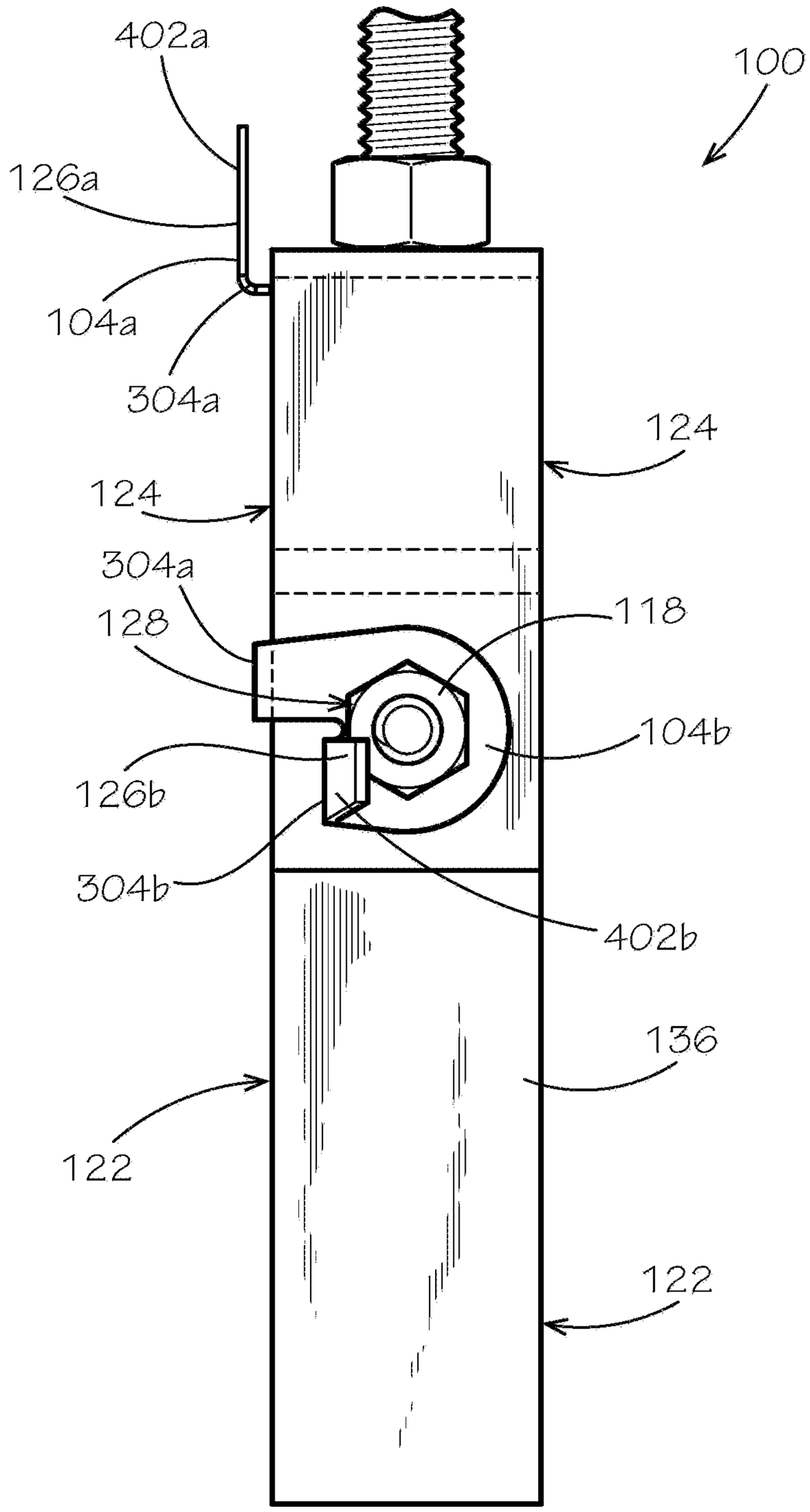
104
106
126a
402
124
126b
114
126a
110
402
402
118
402
126b
116
304a
104
122
102

FIG. 4


402a
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118
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126b
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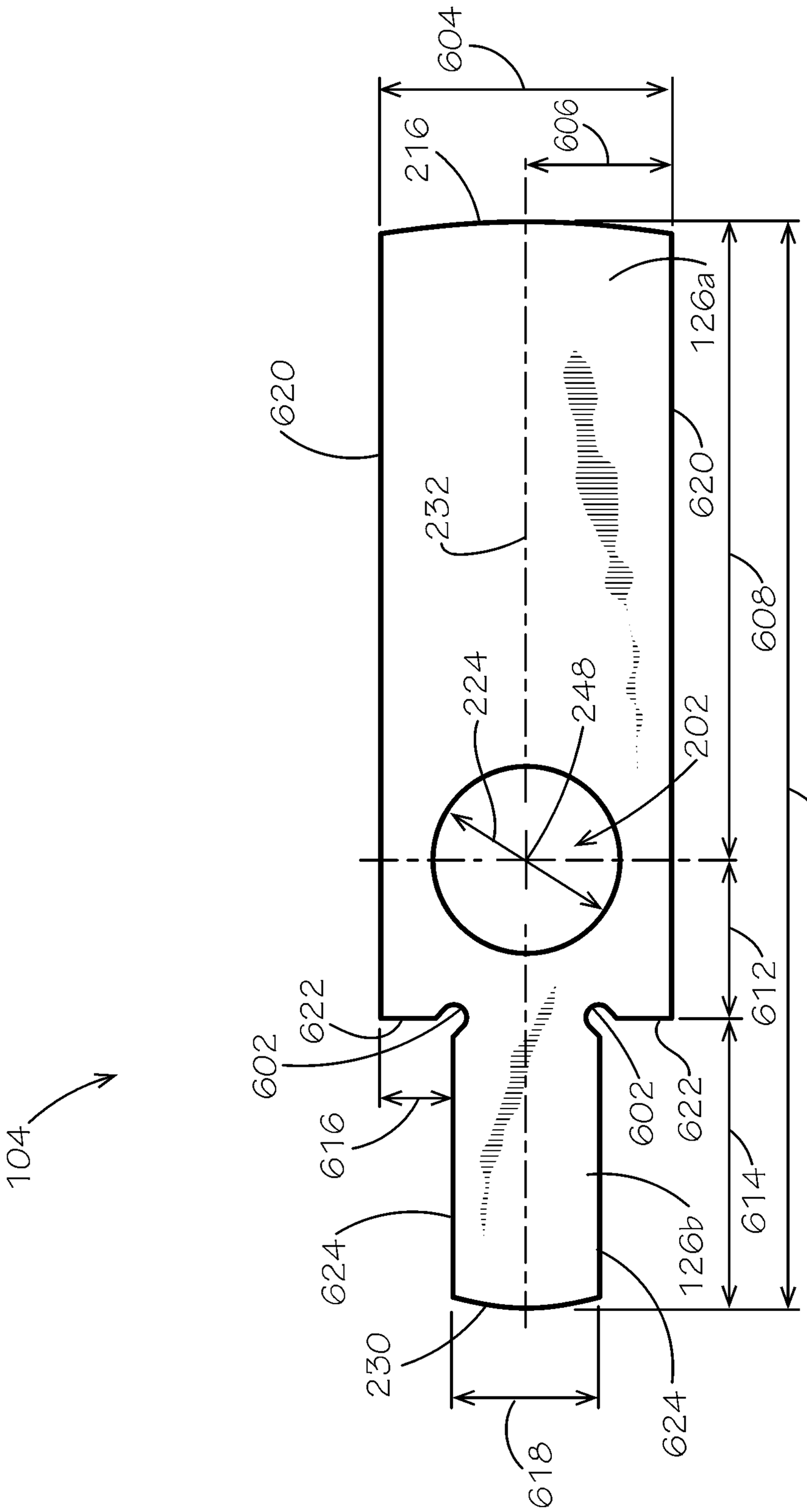
402b
136
122
122

FIG. 5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602
620
622
616
624
230
618
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602
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622
612
614
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126a
604
606
216
232
224
248
202
608
242

FIG. 6

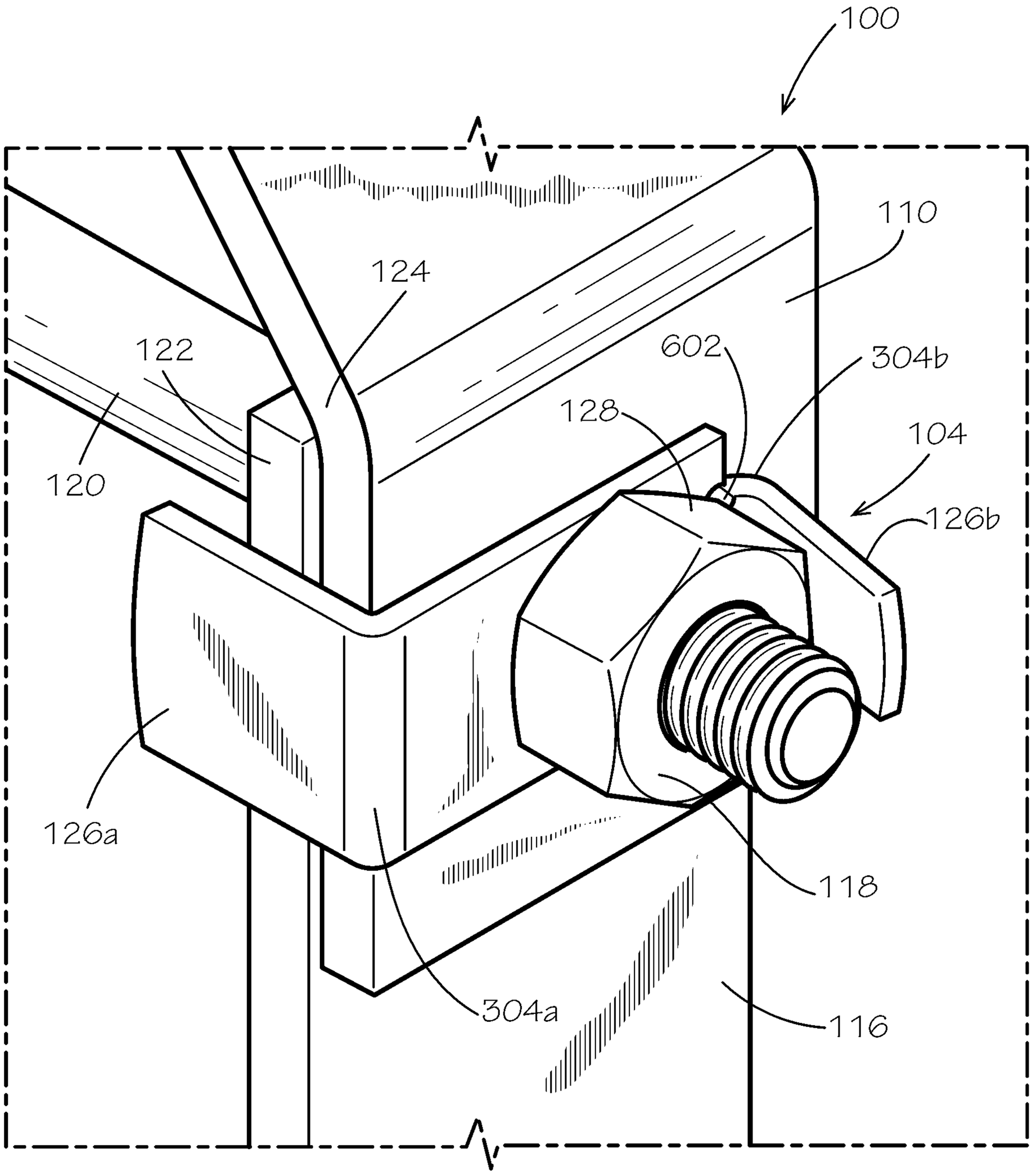


FIG. 7

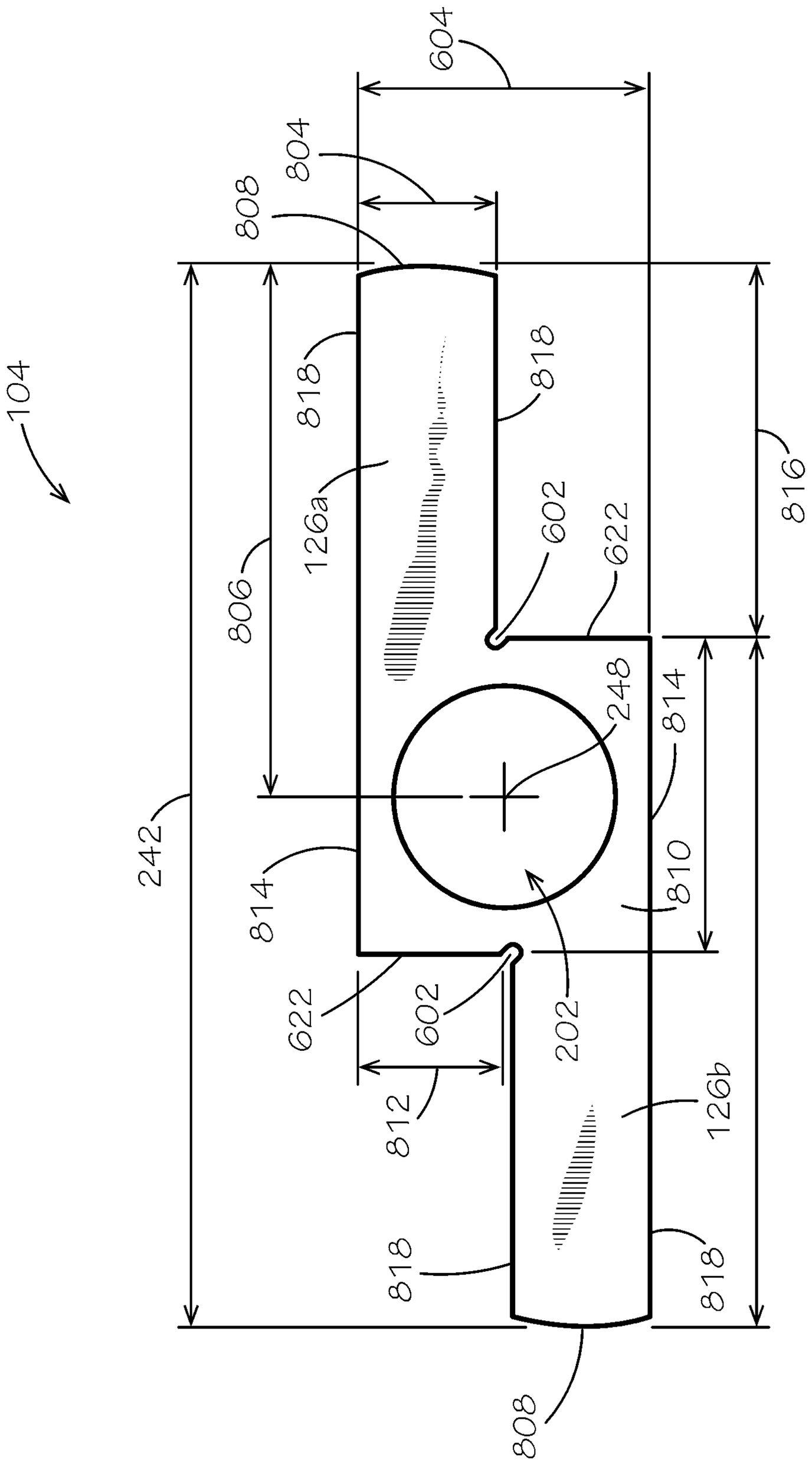
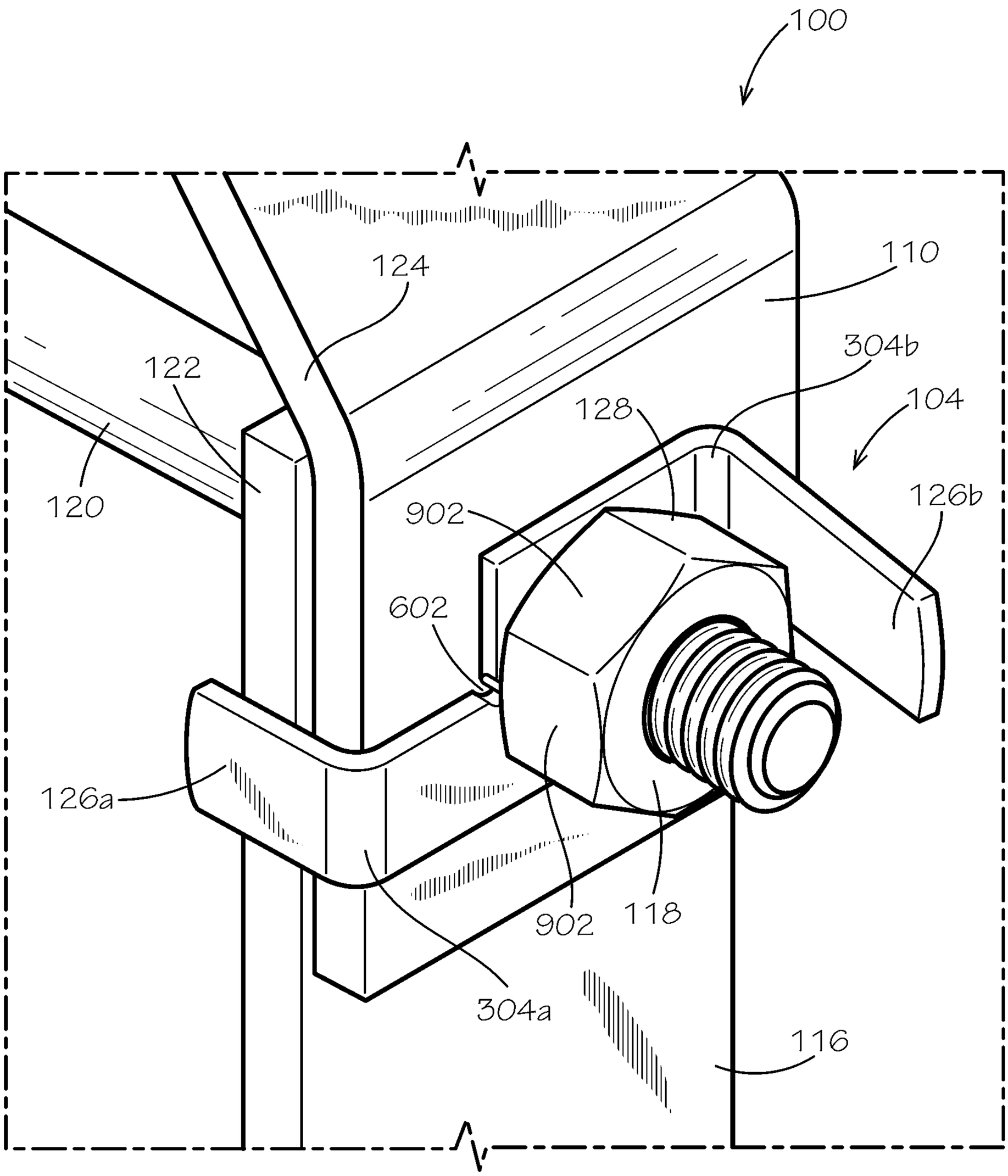

104
604
804
808
818
818
126a
806
602
622
816
248
814
814
242
810
622
602
202
812
126b
818
818
808

FIG. 8


100
124
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122
304b
104
128
120
902
126b
602
126a
902
118
304a
116

FIG. 9

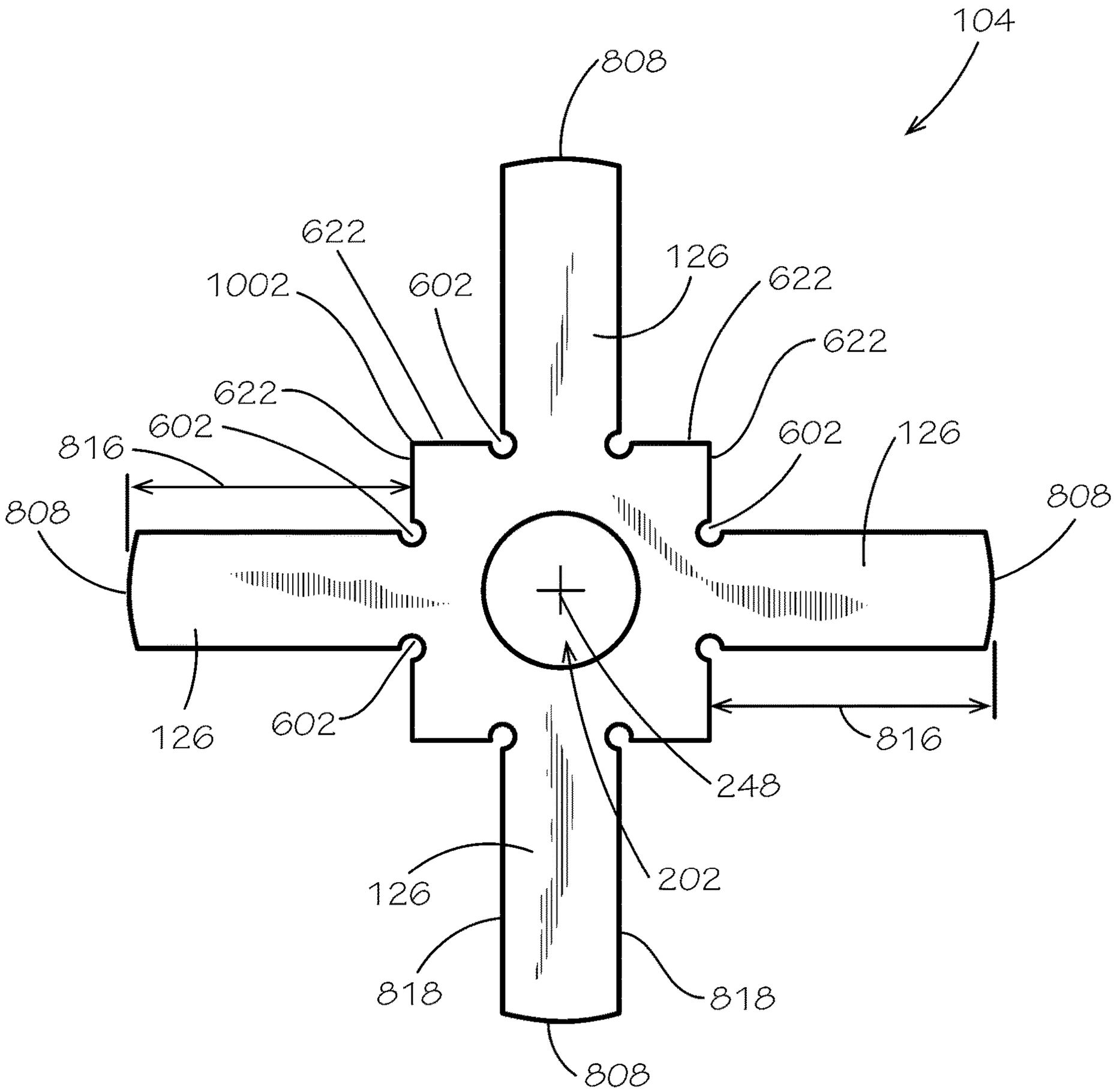
104
808
622
1002
602
126
622
622
602
816
602
126
808
808
126
602
816
248
126
202
818
818
808

FIG. 10

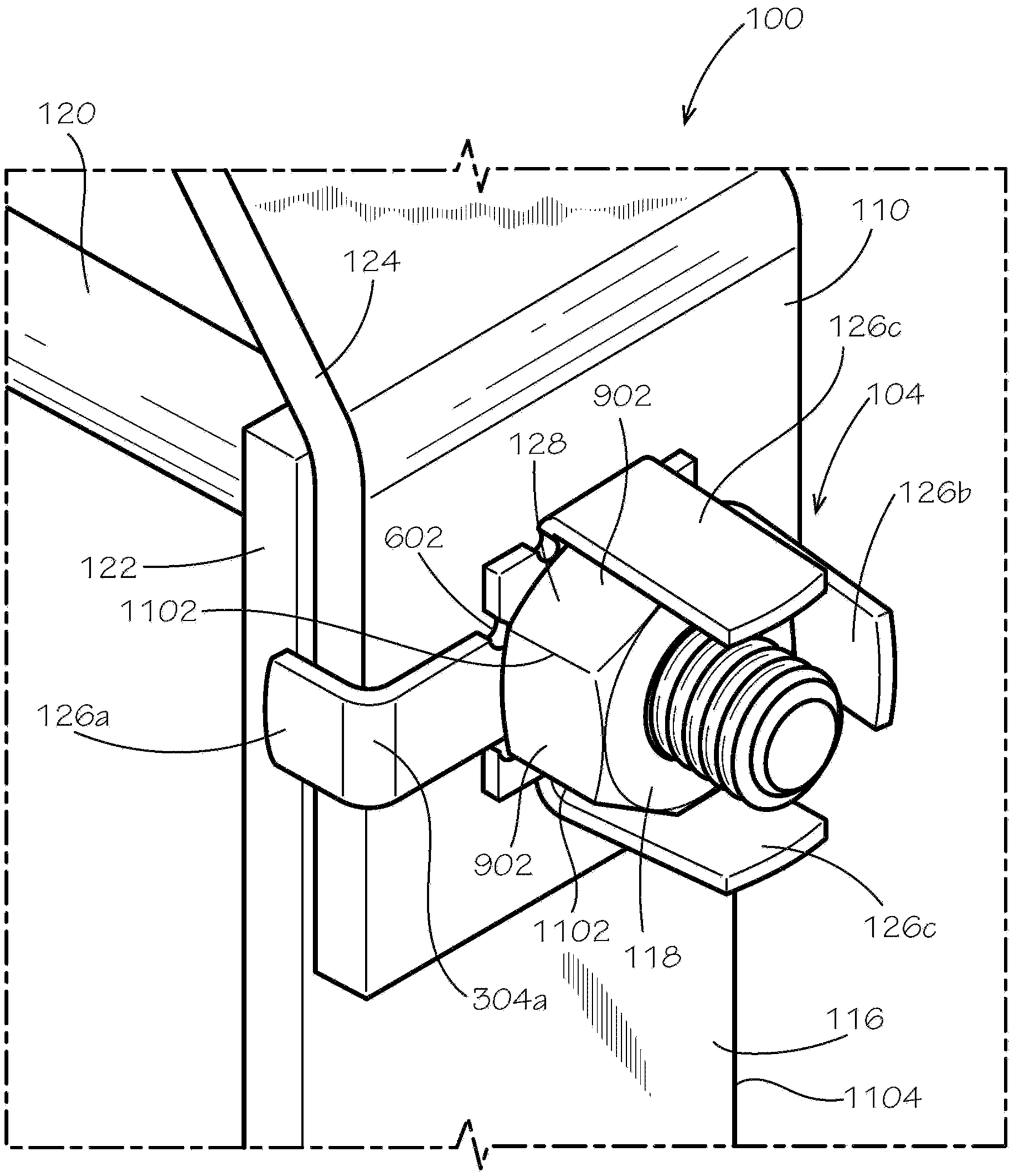
100
120
110
124
126c
902
104
128
126b
602
122
1102
126a
902
1102
118
126c
304a
116
1104

FIG. 11

PIPE HANGER WITH LOCK TAB WASHER

TECHNICAL FIELD

This disclosure relates to hanging pipes. More specifically, this disclosure relates to a pipe hanger with a lock tab washer.

BACKGROUND

Pipes, such as water pipes in a building for sprinkler systems or residential or commercial water use, can be suspended from ceilings by pipe hangers, such as clevis hangers. The parts of a clevis hanger can be secured by attachment mechanisms such as nuts and bolts. These nuts and bolts can loosen, especially in the presence of movement, such as vibrations due to seismic events or everyday vibrations from foot traffic or machine vibrations, or even vibrations from fluid flow and water hammer in the pipes themselves.

SUMMARY

It is to be understood that this summary is not an extensive overview of the disclosure. This summary is exemplary and not restrictive, and it is intended to neither identify key or critical elements of the disclosure nor delineate the scope thereof. The sole purpose of this summary is to explain and exemplify certain concepts of the disclosure as an introduction to the following complete and extensive detailed description.

Disclosed is a hanger for a pipe, the hanger comprising: a suspension member configured to engage the pipe, the suspension member comprising a side edge and defining a hole in through the suspension member; a threaded rod extending through the hole; a nut threaded on the threaded rod; and a lock tab washer disposed on the threaded rod between the suspension member and the nut, the lock tab washer comprising a first tab and a second tab, the first tab bent over a side edge of the suspension member, the first tab configured to prevent the lock tab washer from rotating with respect to the suspension member, the second tab bent over a circumferential side of the nut, the second tab configured to prevent the nut from rotating with respect to the lock tab washer.

Also disclosed is a method of securing a pipe in a hanger, the method comprising: supporting the pipe with a suspension member; inserting a threaded rod through the suspension member; placing a lock tab washer on the threaded rod; threading a nut on the threaded rod; preventing the lock tab washer from rotating with respect to the suspension member by folding a first tab of the lock tab washer over a side edge of the suspension member; and preventing the nut from rotating with respect to the lock tab washer by folding a second tab of the lock tab washer over a circumferential side of the nut.

Various implementations described in the present disclosure may include additional systems, methods, features, and advantages, which may not necessarily be expressly disclosed herein but will be apparent to one of ordinary skill in the art upon examination of the following detailed description and accompanying drawings. It is intended that all such systems, methods, features, and advantages be included within the present disclosure and protected by the accompanying claims. The features and advantages of such implementations may be realized and obtained by means of the systems, methods, features particularly pointed out in the appended claims. These and other features will become more fully apparent from the following description and appended claims, or may be learned by the practice of such exemplary implementations as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and components of the following figures are illustrated to emphasize the general principles of the present disclosure. The drawings are not necessarily drawn to scale. Corresponding features and components throughout the figures may be designated by matching reference characters for the sake of consistency and clarity.

FIG. **1** is a perspective view of a pipe hanging from a hanger comprising a lock tab washer according to one aspect of the present disclosure.

FIG. **2**A is a top view of the lock tab washer of FIG. **1**, in a flat configuration.

FIG. **2**B is a top view of the lock tab washer, in a flat configuration and according to another aspect of the present disclosure.

FIG. **3**A is a perspective view of the lock tab washer of FIG. **2**A, in a folded configuration.

FIG. **3**B is a perspective view of the lock tab washer of FIG. **2**B, in a folded configuration.

FIG. **4** is a front view of the hanger.

FIG. **5** is a side view of the hanger.

FIG. **6** is a top view of the lock tab washer in accordance with another aspect of the present disclosure.

FIG. **7** is a detail view of the hanger assembled with the washer of FIG. **6**.

FIG. **8** is a top view of the lock tab washer in accordance with another aspect of the present disclosure.

FIG. **9** is a detail view of the hanger assembled with the washer of FIG. **8**.

FIG. **10** is a top view of the lock tab washer in accordance with another aspect of the present disclosure.

FIG. **11** is a detail view of the hanger assembled with the washer of FIG. **10**.

DETAILED DESCRIPTION

The present disclosure can be understood more readily by reference to the following detailed description, examples, drawings, and claims, and the previous and following description. However, before the present devices, systems, and/or methods are disclosed and described, it is to be understood that this disclosure is not limited to the specific devices, systems, and/or methods disclosed unless otherwise specified, and, as such, can, of course, vary. It is also to be understood that the terminology used herein is for the purpose of describing particular aspects only and is not intended to be limiting.

The following description is provided as an enabling teaching of the present devices, systems, and/or methods in its best, currently known aspect. To this end, those skilled in the relevant art will recognize and appreciate that many changes can be made to the various aspects of the present devices, systems, and/or methods described herein, while still obtaining the beneficial results of the present disclosure. It will also be apparent that some of the desired benefits of the present disclosure can be obtained by selecting some of the features of the present disclosure without utilizing other features. Accordingly, those who work in the art will recognize that many modifications and adaptations to the present disclosure are possible and can even be desirable in certain circumstances and are a part of the present disclo-

sure. Thus, the following description is provided as illustrative of the principles of the present disclosure and not in limitation thereof.

As used throughout, the singular forms "a," "an" and "the" include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to "an element" can include two or more such elements unless the context indicates otherwise.

Ranges can be expressed herein as from "about" one particular value, and/or to "about" another particular value. When such a range is expressed, another aspect includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by use of the antecedent "about," it will be understood that the particular value forms another aspect. It will be further understood that the endpoints of each of the ranges are significant both in relation to the other endpoint, and independently of the other endpoint.

For purposes of the current disclosure, a material property or dimension measuring about X or substantially X on a particular measurement scale measures within a range between X plus an industry-standard upper tolerance for the specified measurement and X minus an industry-standard lower tolerance for the specified measurement. Because tolerances can vary between different materials, processes and between different models, the tolerance for a particular measurement of a particular component can fall within a range of tolerances.

As used herein, the terms "optional" or "optionally" mean that the subsequently described event or circumstance can or cannot occur, and that the description includes instances where said event or circumstance occurs and instances where it does not.

The word "or" as used herein means any one member of a particular list and also includes any combination of members of that list. Further, one should note that conditional language, such as, among others, "can," "could," "might," or "may," unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain aspects include, while other aspects do not include, certain features, elements and/or steps. Thus, such conditional language is not generally intended to imply that features, elements and/or steps are in any way required for one or more particular aspects or that one or more particular aspects necessarily include logic for deciding, with or without user input or prompting, whether these features, elements and/or steps are included or are to be performed in any particular aspect.

Disclosed are components that can be used to perform the disclosed methods and systems. These and other components are disclosed herein, and it is understood that when combinations, subsets, interactions, groups, etc. of these components are disclosed that while specific reference of each various individual and collective combinations and permutation of these may not be explicitly disclosed, each is specifically contemplated and described herein, for all methods and systems. This applies to all aspects of this application including, but not limited to, steps in disclosed methods. Thus, if there are a variety of additional steps that can be performed it is understood that each of these additional steps can be performed with any specific aspect or combination of aspects of the disclosed methods.

The use of the directional terms herein, such as right, left, front, back, top, bottom, and the like can refer to the orientation shown and described in the corresponding figures, but these directional terms should not be considered limiting on the orientation or configuration required by the present disclosure. The use of ordinal terms herein, such as first, second, third, fourth, and the like can refer to elements associated with elements having matching ordinal numbers. For example, a first light bulb can be associated with a first light socket, a second light bulb can be associated with a second light socket, and so on. However, the use of matching ordinal numbers should not be considered limiting on the associations required by the present disclosure. An element such as a light bulb can be a genus element that encompasses species elements such as an upper light bulb and a lower light bulb. As such, a numeric designator such as **100** can refer to the light bulb and an alphanumeric designator such as **100***a* and **100***b* can refer to the upper light bulb and the lower light bulb, for example and without limitation.

Disclosed is a pipe hanger comprising a lock tab washer and associated methods, systems, devices, and various apparatus. It would be understood by one of skill in the art that the hanger is described in but a few exemplary embodiments among many. No particular terminology or description should be considered limiting on the disclosure or the scope of any claims issuing therefrom.

FIG. **1** is a perspective view of a pipe **102** hanging from a pipe hanger **100** comprising a lock tab washer **104**. In this aspect, the hanger **100** can comprise two lock tab washers **104**, such as a top lock tab washer **104***a* and a side lock tab washer **104***b*. The hanger **100** can be a clevis hanger **100** and can comprise a threaded rod **106**, a top nut **108** disposed on the threaded rod **106**, and an upper clevis **110** disposed on the threaded rod **106** below the top nut **108**. The upper clevis **110** can be, for example and without limitation, a strap stamped from sheet metal. The upper clevis **110** can receive the threaded rod **106** through a rod hole (hidden behind top nut **108**) in a top flattened section **112** of the upper clevis **110**. The top lock tab washer **104***a* can be placed on the threaded rod **106** below the rod hole of the upper clevis **110**. A securing nut **114** (shown more clearly in FIG. **4**) can be disposed on the threaded rod **106** below the lock tab washer **104**.

The top lock tab washer **104***a* can comprise two tabs **126**, the two tabs being a first tab **126***a* folded over a side edge **124** of the upper clevis **110** and a second tab **126***b* folded over a circumferential side **128** of the nut **114**. The tabs **126** can be configured to prevent the washer **104***a* from rotating with respect to the upper clevis **110** and to prevent the securing nut **114** from rotating with respect to the washer **104***a*. The first tab **126***a* can also be called an edge tab **126***a*, and the second tab **126***b* can also be called a nut tab **126***b*. In addition, the pipe **102** can prevent the upper clevis **110** and the hanger **100** from rotating with respect to the threaded rod **106**. As such, the top lock tab washer **104***a* can prevent the securing nut **114** from loosening, and from releasing the pipe **102** and the clevis hanger **100** from the rod **106**. The washer **104***a* can therefore provide vibration resistance to the hanger **100**.

The hanger **100** can further comprise a lower clevis **116** that is configured to hold the pipe **102**. The lower clevis **116** that holds the pipe **102** can be a U-shaped strap and can, for example and without limitation, be stamped from sheet metal. In combination, the upper clevis **110** and the lower clevis **116** can define a suspension member **136**. In some aspects, the lower clevis **116** and the upper clevis **110** can be monolithic with each other such that the clevises **116**, **110** define a single suspension member **136** formed from one piece of material, such as cast iron, for example and without limitation. In other aspects, the suspension member **136** can comprise one or more parts and can be similar to other pipe hangers currently on the market and can be any assembly of

parts configured to attach a pipe **102** to a threaded rod **106**. The lower clevis **116** can attach to the upper clevis **110** by a bolt **120**, which can also be called a threaded rod **120**. Each of the clevises **110**, **116** can comprise two flattened ends **138**, each flattened end **138** defining a hole through which the bolt **120** can be inserted. Specifically, the bolt **120** can be inserted into a first side hole (hidden behind the lower clevis **116**) in the upper clevis **110**, a first side hole **130** in the lower clevis **116**, a second side hole (hidden behind the upper clevis **110**) in the lower clevis **116**, and a second side hole (hidden behind a side nut **118**) in the upper clevis **110**, in order from left to right with respect to the viewing angle of FIG. **1**. The bolt **120** can be secured on the hanger **100** by the side nut **118**, such as a hexagonal (hex) nut. A side lock tab washer **104***b* can be disposed on the bolt **120** between the upper clevis **110** and the nut **118**. The bolt **120** can, for example and without limitation, be threaded only partially on a tail-most end **132** of the bolt **120**.

The side lock tab washer **104***b* can comprise tabs **126** that prevent the nut **118** from rotating on the bolt **120**, similar to the top lock tab washer **104***a*. In the current aspect, the tabs **126** can comprise a first tab **126***a* and a second tab **126***b*, similar to the top lock tab washer **104***a*. The first tab **126***a* can fold over the side edge **124** of the upper clevis **110** and a side edge **122** of the lower clevis **116**, preventing the washer **104***b* from rotating. The second tab **126***b* can fold over the side **128** of the nut **118**, preventing the nut **118** from rotating with respect to the hanger **100**.

The lock tab washer **104** can provide several functions in one unit. It can prevent the nuts **114**, **118** from loosening due to vibrations, particularly when the hangers **100** are supporting overhead pipes **102**. Vibrations can be transmitted through the pipes **102** or from the floor above. It may be inconvenient or difficult to check the tightness of fasteners (such as the nuts **118**) when the hangers **100** are high above typical human reach and often hidden behind ceiling tiles or drywall ceilings. In addition, the washers **104** can be configured to be visible from a location far below the hanger **100**, thereby allowing personnel to identify which components are vibration-resistant by visual inspection while standing on the floor, such as during construction and shortly after the hangers **100** are installed. The washers **104** can be sized and colored to provide visibility. For example, bright colors and high reflectivity materials can be used.

The washers **104** can be carbon steel or any suitable material known in the art, and they can be covered with a layer to provide corrosion-resistance as well as to increase visibility. For example, the washers can be pre-galvanized or zinc-electroplated. They can be coated in yellow or purple chromate, painted orange, or covered or dipped in plastisol, rubber, or epoxy, for example and without limitation.

FIG. **2**A is a top view of the lock tab washer **104** of FIG. **1** in a flat configuration, according to one aspect of the current disclosure. In the present aspect, the washer **104** can define a circular hole **202** at a first end **230** of the washer **104** and a slit **204** at a second end **216** of the washer **104** opposite the first end **230**. The slit **204** can separate the tabs **126** of the washer **104**. The slit **204** can define an open end **206** at the second end **216** and a closed end **208** proximate the hole **202**. The closed end can define a curvilinear edge **210** such as a half circle. The slit **204** and the hole **202** can be separated by washer material, such that the hole **202** and the slit **204** are noncontiguous spaces. The slit **204** can define a width **218** that is less than, for example, one-fourth a diameter **224** of the circular hole **202**. The slit **204** can also define a length **236**.

The first end **230** of the washer **104** can define a curvilinear edge **228**, such as a half circle sharing a same center **248** as the circular hole **202**. The curvilinear edge **228** and the center **248** can define a radius **226** therebetween. The closed end **208** of the slit **204** and the center **248** of the hole **202** can define a distance **238** therebetween. The second end **216** and the center **248** can define a distance **240** therebetween. The washer **104** can define a washer length **242**.

Each tab **126** can have an outer side edge **214** and an inner side edge **212**, wherein each of the outer side edges **214** slope toward each other from the first end **230** to the second end **216**. The second end **216** can define a straight edge **246**. The outer side edge **214** of each respective tab **126** can define an outside angle **244** with a second end axis **250** defined by the straight edge **246**. The washer **104** can be symmetric about a longitudinal axis **232** defined by the slit **204**. The washer **104** can define a width axis **234** that is perpendicular to the longitudinal axis **232** and runs through the center **248** of the hole **202**. The second end **216** can define a width **220**, and a width **222** of the tab **126** at the second end **216** can also be defined.

FIG. **2**B is a top view of the lock tab washer **104** in a flat configuration, according to another aspect of the present disclosure. The curvilinear edge **228** at the first end **230** can be a circle that is concentric with the hole **202**. The circular curvilinear edge **228** can meet the tabs **126** at one or more inflection points **260**. Additionally, the outside edges **214** of each respective tab **126** can be parallel to each other. Similar parts of FIG. **2**A and FIG. **2**B can have the same names and use the same designators.

FIG. **3**A is a perspective view of the lock tab washer **104** in a folded, or a secured, configuration. The washer **104** can define a thickness **302**. The first tab **126***a* can bend at a first bend line **304***a* between the closed end **208** and the open end **206** of the slit **204** (as shown in FIG. **2**A). In the current aspect, the first bend line **304***a* can be approximately one-third of the length **236** from the closed end **208** to the second end **216**. The first tab **126***a* can be folded up in about a 90-degree angle. The second tab **126***b* can fold in a direction opposite the first tab **126***a* (down, in the current aspect) at a second bend line **304***b* proximate to the closed end **208** of the slit **204**, relative to the first bend line **304***a*. In the current aspect, a bent section **402** of the first tab **126***a* of each washer **104** can be shorter than the bent section **402** of the second tab **126***b*. This can be due to the first bend line **304***a* being closer to the open end **206** (shown in FIG. **2**A) of the slit **204**. The fold lines **304***a, b* can run substantially parallel to the width axis **234** running through the hole **202**. The washer **104** can be stamped from sheet metal, for example and without limitation.

FIG. **3**B is a perspective view of the lock tab washer **104** of FIG. **2**B in the folded configuration. One of the inflection points **260** can be seen in this view. Similar parts of FIG. **3**A and FIG. **3**B can have the same names and use the same designators.

FIG. **4** shows a front (down the pipe **102**) view of the hanger **100** in FIG. **1**. As shown (also in FIG. **3**A and FIG. **3**B), the bent section **402** of the first tab **126***a* is shorter than the bent section **402** of the second tab **126***b*.

FIG. **5** shows a side view of the hanger **100**. A second bent section **402***b* of the second tab **126***b* of the side lock tab washer **104***b* can contact the side **128** of the nut **118**. The side edges **122**, **124** of the upper and lower clevises **110**, **116** can be farther from the hole **202** (shown in FIG. **3**A and FIG. **3**B) of the washer **104** than the circumferential side **128** of the nuts **114**, **118**. Thus, the bend lines **304***a, b* can be located differently on each respective tab **126**.

As shown by the first tab **126***a* of the lock tab washer **104***a*, the first tabs **126***a* of each of the lock tab washers **104** can be bent at approximately 90-degrees, and a first bent section **402***a* may not contact the side edges **122**, **124** of the suspension member **136**. The first tabs **126***a* can fold over either of the two side edges **122**, **124** of each clevis **110**, **116**. In other aspects, the user can bend the tabs **126** in various configurations such that the nut **118** is prevented from rotating with respect to the upper and lower clevises **110**, **116**. For example, the bend lines **304***a, b* of the side lock tab washer **104***b* can contact the upper clevis **110** or the nut **118**, allowing less space for slippage.

FIG. **6** is a top view of the lock tab washer **104**, in another aspect in accordance with the present disclosure. The first or the edge tab **126***a* can be distal from the second or the nut tab **126***b* across the washer hole **202** and can extend in an opposite direction from the washer hole **202**. The hole **202** defines the hole diameter **224**. In the present aspect, the nut tab **126***b* can be proximate the first end **230**, and the edge tab **126***a* can be proximate the second end **216**. The first and the second ends **230**, **216** can be curvilinear. The nut tab **126***b* can define a nut tab width **618** that is less than an edge tab width **604** of the edge tab **126***a*. The longitudinal axis **232** can define a plane of reflectional symmetry. The nut tab **126***b* can also comprise two nut tab side edges **624**, each meeting a washer shoulder **622** at a relief notch **602** that can be recessed and curvilinear. Each shoulder **622** can join to a lateral edge **620** of the edge tab **126***a*. The nut tab **126***b* can also define a nut tab length **614** that is shorter than half the washer length **242**. Further lengths can be defined, such as a shoulder width **616**, a distance **608** from the second end **216** to the hole center **248**, a distance **612** from the shoulder **622** to the hole center **248**, and a distance **606** from the longitudinal axis **232** to the lateral edge **620**.

FIG. **7** is a detail view of the hanger **100** assembled with the washer **104** of FIG. **6** in the location of washer **104***b* of FIG. **1**. The washer **104** can be placed on the bolt **120** outside and adjacent the upper clevis **110**, and the side nut **118** can be threaded on the bolt **120** over the washer **104**. The edge tab **126***a* can fold at the first bend line **304***a* (which can also be called the edge bend line **304***a*) over the side edges **124**, **122** of the upper and lower clevises **110**, **116**, respectively. The nut tab **126***b* can fold at the second bend line **304***b* (which can also be called the nut bend line **304***b*) over the circumferential side **128** of the nut **118**. The relief notches **602** can relief to the washer **104** at the nut bend line **304***b*, such that the washer **104** is less likely to rip or tear.

FIG. **8** is a top view of the lock tab washer **104**, in accordance with another aspect of the present disclosure. In the present aspect, the edge tab **126***a* and the nut tab **126***b* can be on opposing sides of the washer hole **202** and can extend in opposite directions that are offset but parallel. The tabs **126***a, b* can be approximately the same size and shape, and they can extend from a central portion **810** defining the washer hole **202**. The washer **104** can have a 180-degree rotation symmetry about the hole center **248**. The tabs can comprise tab ends **808** that are curvilinear. The tabs **126***a, b* can define tab lengths **816**. The symmetric tabs can define a tab width **804**. The hole center **248** and the tab end **808** can define a distance **806** therebetween. The central portion **810** can approximately be a square and can comprise two central lateral edges **814**. A distance **812** between the hole center **248** and each central lateral edge **814** can be defined. The central portion **810** can also comprise two shoulders **622**, each of which meet a tab lateral edge **818** at the relief notch **602**.

FIG. **9** is a detail view of the hanger **100** assembled with the washer **104** of FIG. **8** in the location of washer **104***b* of FIG. **1**. The placement of the washer **104** on the bolt **120** and the location of the bend lines **304***a, b* can be substantially the same as shown and described in FIG. **7**. In the current aspect, either tab **126** can be the nut tab **126***b*, with the other tab **126** being the edge tab **126***a*. The circumferential side **128** of the nut **118** can form a polygon, such as a hexagon for the hex nut **114**, **118**. Each edge of the polygon can define a side face **902** of the nut **114**, **118**. For example, the hex nut **114**, **118** has six side faces **902**. Each side face **902** can also be called a flat **902** of the circumferential side **128**.

Because the nut tab **126***b* in the current aspect is offset to one lateral side of the washer **104**, the nut tab **126***b* may contact only half of a side face **902**. In comparison, the nut tab **126***b* in the aspect of FIG. **7**, which fully covers one of the side faces **902**, may provide for greater vibration resistance than the one shown in FIG. **9**. The lock tab washer **104** of FIG. **9**, however, may leave less unused material behind when it is stamped from a sheet, relative to the washer **104** of FIG. **7**.

FIG. **10** is a top view of the lock tab washer **104** in a flat configuration, in accordance with another aspect of the present disclosure. The washer **104** can comprise four tabs **126**, each of which can have a substantially similar size and shape, such that any one of the tabs **126** can be an edge tab **126***a* (shown in FIG. **11**) or a nut tab **126***b* (shown in FIG. **11**). As such, the tab lengths **816** can be substantially the same. The washer can have 90-degree rotation symmetry about the hole center **248**. The tab ends **808** can be curvilinear. The tab lateral edges **818** can each meet one of the shoulders **622** at one of the relief notches **602**. The shoulders can meet at a shoulder corner **1002**.

FIG. **11** is a detail view of the hanger **100** assembled with the washer **104** of FIG. **10** in the location of washer **104***b* of FIG. **1**. In the current aspect, one of the tabs **126** can be the edge tab **126***a*, and the tab **126** opposite the edge tab **126***a* can be the nut tab **126***b*. The remaining tabs **126** can be lateral tabs **126***c* that are configured to bend adjacent to the nut circumferential side **128** and provide greater vibration resistance. In the present aspect, when the nut **118** is a hex nut **118**, the lateral tabs **126***c* may not contact a substantial portion of one of the nut's **118** side faces **902**. In other aspects, the lateral tabs **126***c* can be bent obliquely, or bent to conform to the circumferential side **128** of the nut **118**, such that greater contact is made with one of the side faces **902**.

One advantage of the lock tab washer **104** in the aspect of FIG. **10** is that assembly can be less dependent on the orientation of the nut **118**. As shown in FIG. **11**, lateral tabs **126***c* align with points **1102**, rather than the flats **902** of the hex nut **118**. In another aspect (not shown), the nut **118** can be rotated slightly, and the tab acting as the nut tab **126***b* of FIG. **11** might align with one of the points **1102** of the nut **118**. The lateral tabs **126***c* can then align with the flats **902**. In that aspect, the lateral tabs **126***c* of FIG. **11** can also be the nut tabs **126***b* (aspect not shown). The tab acting as the nut tab **126***b* in FIG. **11** can then bend against the side edge **1104** opposite side edges **122**, **124**, such that two tabs **126** engage the clevises **110**, **116** and two tabs **126** engage a flat **902** of the nut **118**.

Any of the washers **104** shown in FIGS. **6-11** can also be used as a top washer **104***a* on the upper clevis **110** adjacent to the securing nut **114**. The presently disclosed lock tab washer **104** provides for several advantages over the currently-available solutions for vibration resistance. Personnel can see with the naked eye whether a lock tab washer **104**

has been installed; they can also see when, for example, the edge tab **126***a* of the washer **104** has slipped past the side edge **124**, **122** of the upper or lower clevises **110**, **116**. Thus, personnel can easily identify when replacement of the washer **104** or retightening of the nut **108**, **118** is necessary. Such advantages are particularly useful in the art of suspending pipes **102**, since the pipes **102** may be located in areas that may not receive regular maintenance, and because the consequence of a falling pipe **102** due to a loose nut **114**, **118** may be catastrophic. In addition, the lock tab washers **104** can provide for greater protection against intentional or unintentional removal of the nut **118** from the bolt **120**, because the washers positively engage lateral side edges of each of the nuts **114**, **118** and clevises **110**, **116**.

The lock tab washer **104** can be used to suspend pipes **102** from ceilings as low as five feet or less (such as on submarines), to ceilings as high as 16 feet to 80 feet or more, as in some warehouses. The lock tab washer **104** can be sized with such definiteness as to allow visual inspection from the floor with the naked eye, for example. For some uses, the appropriate washer length **242** (such as for the aspect shown in FIG. **2**A and FIG. **2**B), may be 1.375 inches or less, or 2.875 inches or more. A larger washer **104** size may be more appropriate for uses in which the pipe **102** is suspended from a relatively high ceiling.

Further, in other aspects, the lock tab washer **104** of any of the previously described aspects can be used with any products, such as water and gas products, that utilize nuts **118** and bolts **120**. In some aspects, for example and without limitation, the lock tab washer **104** can be used to hold a nut **118** onto a bolt **120** on a pipe coupling, a flanged connection between two pipe elements such as a valve and a pipe **102**, pipe clamps, and seismic braces.

One should note that conditional language, such as, among others, "can," "could," "might," or "may," unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain embodiments include, while other embodiments do not include, certain features, elements and/or steps. Thus, such conditional language is not generally intended to imply that features, elements and/or steps are in any way required for one or more particular embodiments or that one or more particular embodiments necessarily include logic for deciding, with or without user input or prompting, whether these features, elements and/or steps are included or are to be performed in any particular embodiment.

It should be emphasized that the above-described embodiments are merely possible examples of implementations, merely set forth for a clear understanding of the principles of the present disclosure. Any process descriptions or blocks in flow diagrams should be understood as representing modules, segments, or portions of code which include one or more executable instructions for implementing specific logical functions or steps in the process, and alternate implementations are included in which functions may not be included or executed at all, may be executed out of order from that shown or discussed, including substantially concurrently or in reverse order, depending on the functionality involved, as would be understood by those reasonably skilled in the art of the present disclosure. Many variations and modifications may be made to the above-described embodiment(s) without departing substantially from the spirit and principles of the present disclosure. Further, the scope of the present disclosure is intended to cover any and all combinations and sub-combinations of all elements, features, and aspects discussed above. All such modifications and variations are intended to be included herein within the scope of the present disclosure, and all possible claims to individual aspects or combinations of elements or steps are intended to be supported by the present disclosure.

That which is claimed is:

1. A hanger for a pipe, the hanger comprising:

a suspension member configured to engage the pipe, the suspension member comprising an upper clevis and a lower clevis, the upper clevis defining a side edge and the lower clevis defining a side edge, a hole defined through the suspension member;

a threaded rod extending through the hole;

a nut threaded on the threaded rod; and

a lock tab washer disposed on the threaded rod between the suspension member and the nut, the lock tab washer comprising a washer hole, a first tab and a second tab, the first tab bent over and extending beyond the side edges of the upper clevis and the lower clevis, the first tab configured to prevent the lock tab washer from rotating with respect to the suspension member, the second tab bent over a circumferential side of the nut, the second tab configured to prevent the nut from rotating with respect to the lock tab washer;

wherein the lock tab washer defines an inward-extending first shoulder and an inward-extending second shoulder opposite the first shoulder, the first shoulder joining a first edge of the second tab and the second shoulder joining a second edge of the second tab, wherein the second tab is bent at a bend line extending substantially between the first shoulder and the second shoulder, wherein a width of the lock tab washer from a hole center of the washer hole to a distal end of the first tab is about equal to a width of the lock tab washer from the hole center to the first and second shoulders, and wherein the second tab is elongated and defines a consistent width that is less than a length of the second tab;

wherein the first tab is distal from the second tab across the washer hole of the lock tab washer, the first tab and the second tab extending in opposite directions; and

wherein the lock tab washer further defines a first bend relief notch joining the first shoulder of the lock tab washer with the first edge of the second tab.

2. The hanger of claim **1**, wherein the upper clevis is joined to the lower clevis by the threaded rod and the nut.

3. The hanger of claim **2**, wherein the upper clevis and the lower clevis each comprise two flattened ends through which the threaded rod is inserted.

4. The hanger of claim **2**, wherein the nut is a side nut, the lock tab washer is a side lock tab washer adjacent to the side nut, the threaded rod is a horizontal bolt, and the hanger further comprises:

a top threaded rod disposed vertically through the upper clevis;

a top lock tab washer placed on the top threaded rod below a top section of the upper clevis; and

a securing nut threaded on the top threaded rod adjacent to the top lock tab washer.

5. The hanger of claim **1**, wherein the lock tab washer is symmetric about a longitudinal axis.

6. The hanger of claim **5**, wherein:

the first tab defines a first tab width; and

the consistent width of the second tab is less than the first tab width.

7. The hanger of claim **1**, wherein the lock tab washer is configured to be visible from a floor when the hanger is suspended from a ceiling.

8. The hanger of claim 7, wherein the lock tab washer is covered in plastisol.

9. The hanger of claim 1, wherein the lock tab washer further defines a second bend relief notch joining the second shoulder of the lock tab washer with the second edge of the second tab.

10. The hanger of claim 9, wherein each of the first bend relief notch and the second bend relief notch is curvilinear.

11. The hanger of claim 1, wherein the distal end of the first tab is curvilinear.

12. The hanger of claim 1, wherein a distal end of the second tab is curvilinear.

13. The hanger of claim 1, wherein the first shoulder joins a first lateral edge of the first tab, and the second shoulder joins a second lateral edge of the first tab.

14. The hanger of claim 1, wherein a length of the first tab is greater than the length of the second tab.

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